

CLAIMS

1. Apparatus for plasma treating a substrate comprising:-  
a chamber within which one or more gases are caused to  
5 flow;  
a plasma generator for causing the gas(es) within the  
chamber to form a plasma, thereby generating at least one  
species; and  
a guide for directing the gas flow containing the  
10 species towards the substrate;  
wherein the apparatus is arranged such that the width  
of the plasma in use is greater than that of the substrate,  
the difference between the widths defining an outer region  
of plasma, and wherein the guide is adapted to direct  
15 species from substantially all of the outer region, towards  
the substrate.
2. Apparatus according to claim 1, wherein the guide is  
adapted to direct towards the substrate at least the  
species generated substantially at or adjacent the  
20 periphery of the plasma.
3. Apparatus according claim 1 or claim 2, further  
comprising a deflector device within the chamber for  
directing the gas(es) introduced into the chamber towards  
the most active region(s) of the plasma.
- 25 4. Apparatus according to any of the preceding claims,  
wherein at least part of the guide is substantially curved  
in section.
5. Apparatus according to any of claims 1 to 3, wherein  
the guide is substantially linear in section.
- 30 6. Apparatus according to claim 5, wherein the guide is  
substantially a hollow conical frustum.
7. Apparatus according to any of the preceding claims,  
wherein the guide is adapted to cause a nett flow of  
species across the substrate.
- 35 8. Apparatus according to any of the preceding claims,  
wherein the guide is adapted to shield the substrate from  
electromagnetic radiation originating from the plasma.

9. Apparatus according to any of the preceding claims, wherein the guide further comprises a plasma termination device so as to attenuate the supply of electrically charged species to the substrate.
- 5 10. Apparatus according to claim 9, wherein the plasma termination device is an electrically conducting mesh.
11. Apparatus according to claim 10, further comprising an electrical power supply for powering the electrically conducting mesh.
- 10 12. Apparatus according to claim 9, wherein the plasma termination device is a magnet.
13. Apparatus according to any of the preceding claims, wherein the material comprising at least the surface of the guide for contacting the gas flow, is arranged to prevent
- 15 the quenching of active species within the gas flow.
14. Apparatus according to any of the preceding claims, further comprising a heating system arranged to heat the guide to a predetermined temperature when in use.
15. Apparatus according to any of the preceding claims,
- 20 wherein the guide is detachable.
16. Apparatus according to any of claims 1 to 14, wherein the guide is formed from the chamber walls.
17. Apparatus according to any of the preceding claims, wherein the plasma generator comprises at least one of an
- 25 induction coupled plasma generator, a microwave plasma generator or an electrode plasma generator.
18. Apparatus according to any of the preceding claims, further comprising a support for supporting the substrate.
19. Apparatus according to claim 18, wherein the support
- 30 is located within the chamber.
20. Apparatus according to claim 18 or claim 19, wherein the support is moveable so as to provide a variable distance between the plasma and the substrate.
21. Apparatus according to any of claims 18 to 20, wherein
- 35 the guide is mounted to the support.

22. Apparatus according to any of claims 18 to 21, further comprising an electrical supply system adapted to supply electrical power to the support.

23. Apparatus according to any of the preceding claims, wherein the guide is arranged to have an external dimension just less than that of the chamber such that, during use the guide undergoes thermal expansion and comes into thermal contact with the chamber.

24. Apparatus according to any of the preceding claims, wherein the guide further comprises an underside surface arranged to recompress the plasma as it flows substantially radially in a region adjacent the edge of the substrate.

25. A method for plasma treating a substrate comprising:-  
causing one or more gases to flow within a chamber;  
forming a plasma from the gas(es) within the chamber using a plasma generator, thereby generating at least one species; and

directing the gas flow containing the species towards the substrate;

wherein the width of the plasma in use is greater than that of the substrate, the difference between the widths defining an outer region of plasma, and wherein the species are directed from substantially all of the outer region, towards the substrate.

26. A method according to claim 25, wherein the plasma is an induction coupled plasma.

27. A method according to claim 26, wherein an electrical power is provided to the substrate so as to control the interaction of the species with the substrate.

28. A method according to claim 27, wherein the electrical potential is an RF potential.

29. A method according to any of claims 25 to 28, wherein the gas pressure within the chamber is in the range 1 to 15 Pa.

30. A method according to any of claims 25 to 29, wherein the gas(es) comprise one or more of SF<sub>6</sub>, chlorine, fluorocarbon compounds, nitrogen, oxygen or silane.

31. A method according to any of claims 25 to 30, wherein the power input of the plasma generator is about 5 kW.

32. A method according to any of claims 25 to 31, wherein the gas flow rate is about 500 standard cubic centimetres  
5 per minute.

33. A method according to any of claims 25 to 32, wherein the plasma treatment comprises an etching treatment.

34. A method according to any of claims 25 to 33, wherein the plasma treatment comprises a deposition treatment.

10 35. A method according to any of claims 25 to 34, wherein at least the species generated substantially at or adjacent the periphery of the plasma are guided onto the substrate.

36. A method according to any of claims 25 to 35, further comprising directing the gas(es) introduced into the  
15 chamber towards the most active region(s) of the plasma.

37. A method according to any of claims 25 to 36, further comprising causing a nett flow of the species across the substrate.

38. A method according to any of claims 25 to 37, using  
20 apparatus according to any of claims 1 to 24.